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1. SCOPE

1.1 Content. This document establishes the general manufacturing and testing requirements for monolithic microcircuits. Detail requirements, specific characteristics of microcircuits, and other provisions which are sensitive to the particular use intended shall be specified in the applicable detail specification. This document is intended to provide a level of quality and reliability suitable for the acquisition of non-Qualified Parts List (QPL) microcircuits for JPL Mission Class A and B applications; it is not intended for qualification of parts or for certification as defined by MIL-M-38510, or for listing on an approved parts list.

2. APPLICABLE DOCUMENTS

2.1 Applicable Documents. The Class S requirements of the following documents, of the issue indicated, form a part of this specification unless exceptions are noted herein, in the detail specification, or in the procurement document. (The intent is that MIL-M-38510 and MIL-STD-883 shall form the baseline; this document lists exceptions to them.) The contractor may contact the contract negotiator to obtain copies of these documents.

SPECIFICATIONS

Military

MIL-M-38510H, Microcircuits, General Specification for, including Amendments 1 through 5

STANDARDS

Military

MIL-STD-883C, Test Methods and Procedures for Microelectronics, including Notices 1-12, except substitute for Method 1019 the text of "MIL-STD-883, Proposed Method 1019.4" dated 1/28/91

2.1.1. Exceptions. References to the U.S. Government and its agencies shall be taken to refer to JPL [(e.g., JPL Quality Assurance (QA) source inspection shall be substituted for Government Source Inspection (GSI)]. References to "JAN", "QPL", and "qualified" do not apply. The detail specification shall be the JPL detail specification.

3. REQUIREMENTS

Requirements of Paragraph 3 apply with the exception of the following:

3.1 General

3.1.2 Conflicting requirements. Delete items a. through c. and substitute as follows:

a. Procurement document (contract or purchase order)

b. Applicable device specification (associated detail specification or drawing)

c. This specification

d. Specification and Standard referenced in 2.1

3.1.3 Terms, definitions, and symbols. Modify as follows:

3.1.3.15 Delta limit. Add: All deltas (whether expressed as absolute or percentage values) shall compare the measurement after burn-in with that recorded prior to the same burn-in.

3.1.3.18 Acquiring activity. Delete the first sentence and substitute as follows: "The acquiring activity shall be JPL or its subcontractor; the representative usually will be the JPL contract technical manager or contract negotiator."

3.1.3.19 Qualifying activity. Delete and substitute: "The organization within JPL or its subcontractor that grants approval for acquisition of a particular product from a given manufacturer."

Add the following items:

3.1.3.34 Control unit. A control unit is a part of the same device type, package, and manufacturer (but not necessarily the same lot) as the test specimens, but which is not subjected to any of the stresses that are applied to the test specimens. It is used to verify the repeatability of measurements.

3.1.3.35 Trace number. The trace number is the number assigned by the procurement document to link a part number to a specific purchase order or Order Release.

3.1.3.36 Contract technical manager. The contract technical manager shall be the principal technical interface between the manufacturer and JPL.

3.1.3.37 Certification. Certification shall mean approval by JPL of a manufacturer for acquisition of a family of devices. Government certification as intended in MIL-M-38510 and MIL-STD-976 is not implied.

3.2 Item requirements

3.2.1 Country of manufacture. Delete.

3.3 Classification of requirements

3.3.1 Certification of conformance and acquisition traceability. Modify as follows:

a. (3) Product assurance level need not be recorded.

3.4 Quality assurance requirements. Add the following: "Devices which have not been tested for Electrostatic Discharge Sensitivity (ESDS) classification shall be considered to be Class 1."

3.4.1 Qualification. Delete.

3.4.2 Change to qualified product or quality assurance program. The JPL contract technical manager shall be substituted for the "qualifying activity" to be notified prior to implementation of any major change (as defined herein). Delete references to testing, approval, shipments, and DESC forms.

3.4.4 Quality conformance inspection(QCI). Add: "... unless the JPL contract technical manager has given technical direction to ship ahead of QCI completion or unless prior shipment is required herein (e.g., DPA samples and catastrophic failures)."

3.6 Marking of microcircuits. Delete requirement to mark with manufacturer's designating symbol (item e).

3.6.2 Part number. Substitute that the part number shall be marked in accordance with the JPL detail specification. The basic pattern shall be as follows:

33333-U33333FR

where:

33333	identifies the detail specification
U	identifies the JPL descriptor code for the device family (U is for microcircuits)
33333	is the generic or manufacturer's catalog part number (or a part thereof)
F	indicates the general package style: D = dual in-line (DIP) F = flat-pack P = diamond-based cans (TO-3, TO-66) T = TO-5, TO-18, TO-39 type cans
R	identifies the level of total ionizing dose (TID) testing which the lot passed (identified in para. 3.6.2.2)

3.6.2.2 Radiation Hardness Assurance (RHA) designator. Add the following: RHA designators shall refer to total dose only and shall be assigned as follows:

NOTE

Asterisk indicates irradiation levels not standard to M38510.

M = 3 krads

D = 10 krads
N = 15 krads*
S = 20 krads*
P = 50 krads*
Q = 75 krads*
R = 100 krads
T = 150 krads*
W = 200 krads*
H = 1,000 krads
X, Y = unassigned: refer to detail specification

3.6.9.2 Electrostatic discharge sensitivity identifier. Add the following: "When a device's ESDS class has not been determined by test, it shall be marked and handled as Class 1."

Add paragraph 3.6.14 as follows:

3.6.14 Life test part identifier. Devices which successfully pass the Group B.5 life test and subsequent seal tests shall have the letter "Q" added as a suffix to the lot number marking.

Add paragraphs 3.8 through 3.12 as follows:

3.8 JPL review of manufacturer's documentation. The manufacturer shall make available the following items for review and approval by technical direction from the JPL contract technical manager prior to use with their respective JPL lots:

a. Lot traveler(s) for each part type (covering assembly, screen, and QCI operations).

b. Electrical test program and data recorded from a device of the specified type taken over the full specified temperature range

c. Bench test procedures, if applicable

d. Radiation test plan, if applicable

3.9 JPL QA survey or audit. JPL QA may perform a survey to ascertain general compliance with the Quality Assurance Program requirements of MIL-M-38510 Appendix A. Information regarding recent DESC audits, if any, shall be provided upon request.

3.10 Problem notification. The contractor shall notify the JPL contract technical manager and the contract negotiator within two working days of the occurrence of any of the following.

a. Any catastrophic failure after initial electrical test

b. Any failures in excess of Percent Defective Allowable (PDA), including failures which appear to result from equipment failure or operator error

c. Any QCI failure

d. Any need for re-marking serial numbers

e. Any need for re-bonding

f. Any case in which the number of wafers accepted in radiation testing is insufficient to yield the quantity of devices required by the procurement document.

3.11 Status reporting. The contractor shall provide the JPL contract technical manager and the contract negotiator every two weeks with an oral or written status report stating the current status (point on the lot traveler and quantity of parts in the lot) and expected ship date of each lot in process, and noting any significant problems.

3.12 Destructive Parts Analysis (DPA) samples. The manufacturer shall make available to the JPL contract technical manager 5 samples (or 3 samples in the case of lots containing 50 parts or fewer) upon completion of final electrical test in screening. These DPA samples may be delta rejects and/or high- and low-temperature parametric rejects. The manufacturer shall continue processing of the lot. There is no lot jeopardy associated with the results of JPL's DPA.

4. QUALITY AND RELIABILITY ASSURANCE PROVISIONS

Requirements of paragraph 4 apply with the exception of the following:

4.1 Responsibility for inspection

4.1.4 Government source inspection. Substitute for the first two sentences: "JPL source inspection shall be required on all microcircuit devices acquired to the requirements of this specification. JPL QA personnel will perform a survey to ascertain general compliance with the requirements of Appendix A."

4.1.4.1 Government source inspection for Class S devices. Delete the paragraph and substitute as follows: "(1) The manufacturer shall make available at the earliest practicable time the wafer lot acceptance test report and the radiation test report (if such testing is required) to the contract technical manager for JPL review and approval. The report(s) shall be included with the data to accompany the parts at shipment. The manufacturer shall continue processing the lot: he shall not stop work pending receipt of JPL approval. (2) JPL QA will perform 100% internal visual inspection at precap, and 100% visual inspection and audit of documentation at pre-ship. (The latter may be waived by technical direction from the JPL contract technical manager if QA personnel are not available.) The contractor shall notify JPL QA at least two working days in advance of the scheduled inspection time. Adequate inspection stations shall be provided for the JPL QA representative. (3) JPL QA representatives shall have the option of performing surveillance at any of the points listed as items a through k of paragraph 4.1.4.1."

4.3 General inspection conditions.

4.3.2 Sampling.

4.3.2.1 Disposal of samples. Delete the last sentence and substitute as follows: "Samples used for Group B.5 life test shall be shipped to JPL. The manufacturer shall retain with the lot data any other samples used in QCI and radiation LAT for JPL lots."

4.3.4 Test method deviation. Note that deviations must be approved by technical direction from the JPL contract technical manager before testing is begun.

4.3.5 Procedure in case of test equipment failure or operator error. Substitute the JPL contract technical manager for GSI. Add: "JPL retains the option of performing any failure analysis: the manufacturer shall not do any analysis destructive of the part without prior consent of the JPL contract technical manager." Delete the following sentence: "If no challenge is made within the next working day, the error will be considered valid as recorded."

4.3.6 Test equipment verification. Add as follows: "Three (3) control units shall be measured and recorded immediately before and after each set of electrical measurements of the test specimens. (It is preferred that the same control units be used for all JPL lots of the same device type.) Each set of control unit measurements shall be checked for consistency with the last prior set of control unit measurements before proceeding with testing of the lot. In the event of significant discrepancy between two sets of readings, corrective action (maintenance or re-calibration of the test equipment) and retest of control units shall be accomplished before proceeding with testing of the lot. Note that these control units shall be used for measurements during QCI and radiation tests as well as during screening."

4.4 Qualification procedures. Delete.

4.5 Quality conformance inspection.

4.5.1 General. Delete the final 2 sentences: Process monitor or SPC shall not be substituted. Add the following: "QCI test data, completed traveler, and sample devices used for Group B.5 life test shall be shipped to JPL. Any other QCI samples shall be retained by the manufacturer."

4.5.2 Group A inspection. Add the following: "Group A inspection shall be performed on 100% of the parts."

4.5.3 Group B inspection. Add the following: "Group B.5 Life test parts shall be tested for fine and gross leak in accordance with MIL-STD 883 Method 1014 after completion of the post-life test electrical measurements. There is no lot jeopardy associated with this hermeticity test.

4.5.6 Group E inspection. Add the following: "Radiation testing is not required unless specified. If it is required, it shall be performed as soon as practicable after wafer fab. The manufacturer shall perform the tests unless the detail specification or procurement document requires that JPL do

so. Test method shall be in accordance with the Group E (Table V) QCI requirements of MIL-STD-883 Method 5005 except that the MIL-STD-883 Method for total dose (subgroup 2) shall be Method 1019.4 (proposed revision dated 1/28/91) except that the dose rate (paragraph 3.5) shall be 100 rads(Si)/s. Type of test (which subgroup(s) of Group E), radiation levels, bias circuit, and applicable electrical parametric limits will be defined in the detail specification."

Add paragraphs 4.5.6.2 and 4.5.6.3 as follows:

4.5.6.2 Procedure when manufacturer performs radiation testing. The manufacturer shall make available to the JPL contract technical manager for review and approval a proposed radiation test plan prepared in accordance with Method 1019.4. The manufacturer shall assemble test devices from each wafer and test in accordance with the appropriate Group E methods of MIL-STD-883 Method 5005 (substituting the 1/28/91 draft of Method 1019.4) and as specified in the detail specification and/or procurement document (if applicable). Electrical measurements shall be made at the specified points.
4.5.6.2.1 Procedure for MOS devices. Time Dependent Effects (TDE) testing in accordance with paragraph 3.10 of MIL-STD-883 Method 1019.4 (proposed, dated 1/28/91) is required for Metal Oxide Semiconductor (MOS) devices. Test samples for TDE which have not been burned-in shall receive 48 hours of pre-irradiation burn-in (using circuit specified in the detail specification) at 125°C. In addition, the post-irradiation measurement requirements of Method 1019.4 paragraph 3.9 shall be revised such that measurements following each irradiation must be completed within 1 hour of the end of irradiation.

4.5.6.3 Procedure when JPL performs radiation testing. The manufacturer shall assemble test devices from each wafer, perform room temperature electrical test (preceded by a 48-hour burn-in at 125°C if TDE testing is planned), and deliver the test devices to JPL to the attention of the contract technical manager. The latter will advise of the acceptability of each of the wafers upon completion of testing.

4.5.8 Nonconformance. Add the following: "The JPL contract technical manager and contract negotiator shall be notified within two working days of any lot failure."

4.6 Screening. Add the following: "Screening rejects (including Particle Impact Noise Detection (PIND) test rejects) which are not catastrophic electrical rejects shall be collected, identified as to which test was failed, and retained at the manufacturer's facility with the master set of lot data. The manufacturer will not, however, be required to submit these rejects to be counted by JPL QA representatives."

4.6.1 Burn-in.

4.6.1.2 Burn-in acceptance criteria. Add the following: "Resolution of electrical test data shall be equal to or better than 10% of the delta limit on that parameter."

4.6.1.2.1 Failure analysis of burn-in screen failures for class S devices. Delete and substitute as follows: "JPL retains the option to perform failure analysis of catastrophic failures, which are defined as follows:

a. opens and shorts measurable or detectable at any specified temperature or voltage

b. any part which fails any of the subgroup 7 and 8 functional tests.

The contractor shall notify the JPL contract technical manager and contract negotiator within two working days of the occurrence of such failure."

4.8 Data recording. Substitute the JPL contract technical manager for government qualifying or acquiring activities.

4.8.1 Screening test data for Class S microcircuits. Delete and substitute as follows: "The following data shall be included with each shipment of screened parts:

a. a copy of the completed lot traveler(s) used for screening and QCI

b. a copy of attributes test data, including the wafer lot acceptance test report (including SEM photos), X-ray report and films, and any applicable radiation test data

c. electrical test data for all specified tests, including control unit data

d. data for any other special tests required by the detail specification or procurement document

e. copies of reports on any failure analyses, DPA, or engineering evaluations performed by the manufacturer

f. copies of any waivers or Technical Direction Memoranda (TDMs) altering the specified requirements.

If tests are labeled with test numbers, a cross-reference shall be provided to relate test numbers to descriptive test name (e.g, IIL, VOH) and pin number. It is preferred that printed electrical test data be formatted such that all measurements of a given parameter are displayed in a column, in serial number order. Electrical test data also shall be provided in a magnetic medium: either IBM DOS-compatible 5-1/4" or 3-1/2" diskette with data in ASCII format or 9-track tape (800 or 1600 bpi) with data in ASCII or EBCDIC format. (If the requirement for magnetic data is waived, two copies of printed data shall be provided.)"

5. PACKAGING

Requirements of paragraph 5 apply with the following additions:

5.1 Packaging requirements. All devices shall be handled as class 1 for purposes of ESD protection unless specified otherwise.

5.1.2 Marking of container. Add the requirement for marking the initial container (unit package, e.g., tube or bag) with the JPL trace number.

5.2 Packing slip and invoice. The packing slip and invoice shall include the JPL trace number associated with each line item.

6. NOTES

Delete and substitute as follows:

6.1 Ordering data.

a. Part number

b. Associated detail specification number

c. Any difference in test data requirements from those listed in 4.8 herein.

d. Requirements for special carriers, lead lengths, or lead forming, if applicable.

e. Name and telephone number of JPL contract technical manager

f. Name and telephone number of JPL QA coordinator of source inspections

g. JPL trace number

h. Any special requirements which differ from those indicated herein or in the detail specification (e.g., those involving source inspections, traceability, radiation test, etc.).

6.2 Intended use. Microcircuits conforming to this specification are intended for use when Class S qualified parts of adequate radiation hardness are not available. When a device has been qualified for listing in QPL 38510 Class S, at an acceptable radiation hardness level, this specification shall not be used for new design: the QPL 38510 Class S product shall be preferred for all applications.

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